

# PATENT ABSTRACTS OF JAPAN

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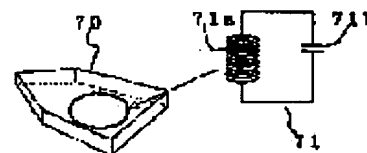
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## (54) DIGITIZER

### (57)Abstract:

**PURPOSE:** To provide a digitizer which has a tuning circuit and is capable of identifying the front, rear and direction of a cordless indicator.

**CONSTITUTION:** This digitizer detects the position of the indicator 70 by the induction voltage induced in a loop coil on a sensor side by the radio waves generated from a coil 71a of the tuning circuit 71 disposed at the indicator 70. The output level of the radio waves outputted from the coil 71a of the tuning circuit 71 is so set as to vary with the front surface side and rear surface side of the indicator 70.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The location detecting element to which it has the sensor and indicator which transmit and receive an electromagnetic signal mutually, and the above-mentioned sensor comes to arrange two or more loop-formation coils to a predetermined plane, The selection circuitry which makes sequential selection of the one loop-formation coil from two or more above-mentioned loop-formation coils, The receiving circuit which detects the induced voltage generated in the sending circuit and this loop-formation coil which supply the AC signal of predetermined frequency to the above-mentioned loop-formation coil, It has the electronic switch which connects to the above-mentioned sending circuit and the above-mentioned receiving circuit by turns one loop-formation coil chosen in the above-mentioned selection circuitry. The tuning circuit which sides with the electric wave generated from the loop-formation coil with which the above-mentioned AC signal was supplied including a coil and a capacitor in the above-mentioned indicator is prepared. In the digitizer which detects the location of the above-mentioned indicator with the induced voltage by which induction is carried out to the above-mentioned loop-formation coil by the electric wave generated from the coil of the above-mentioned tuning circuit The digitizer characterized by being constituted so that the output levels of the electric wave outputted from the coil of the above-mentioned tuning circuit may differ by the front-face [ of the above-mentioned indicator ], and rear-face side.

[Claim 2] The digitizer according to claim 1 characterized by preparing the ferromagnetic which strengthens the output level of the electric wave outputted from the coil of the above-mentioned tuning circuit to either the front-face side of the above-mentioned indicator, or a rear-face side.

[Claim 3] The digitizer according to claim 1 characterized by establishing the field attenuating means which weakens the output level of the electric wave outputted from the coil of the above-mentioned tuning circuit to either the front-face side of the above-mentioned indicator, or a rear-face side.

[Claim 4] The location detecting element to which it has the sensor and indicator which transmit and receive an electromagnetic signal mutually, and the above-mentioned sensor comes to arrange two or more loop-formation coils to a predetermined plane, The selection circuitry which makes sequential selection of the one loop-formation coil from two or more above-mentioned loop-formation coils, The receiving circuit which detects the induced voltage generated in the sending circuit and this loop-formation coil which supply the AC signal of predetermined frequency to the above-mentioned loop-formation coil, It has the electronic switch which connects to the above-mentioned sending circuit and the above-mentioned receiving circuit by turns one loop-formation coil chosen in the above-mentioned selection circuitry. The tuning circuit which sides with the electric wave generated from the loop-formation coil with which the above-mentioned AC signal was supplied including a coil and a capacitor in the above-mentioned indicator is prepared. In the digitizer which detects the location of the above-mentioned indicator with the induced voltage by which induction is carried out to the above-mentioned loop-formation coil by the electric wave generated from the coil of the above-mentioned tuning circuit The digitizer characterized by establishing the 1st direction discernment means which the level of the electromagnetic signal transmitted and received in between [ these ] is changed with the sense of the above-mentioned indicator, and identifies the direction of this indicator between the coil of the above-mentioned tuning circuit, and each loop-formation coil of the above-mentioned sensor.

[Claim 5] Both the direction discernment means of the above 1st are digitizers according to claim 4 characterized by coming to form each of the loop-formation coil of the above-mentioned sensor, and the coil of the above-mentioned tuning circuit in the unsymmetrical configuration of isomorphism.

[Claim 6] The direction discernment means of the above 1st is a digitizer according to claim 4 characterized by consisting of a ferromagnetic which strengthens the output level of the electric wave which is attached in the front face of the above-mentioned sensor, and one [ at least ] field of the above-mentioned indicator so that some of above-mentioned loop-formation coils and coils of the above-mentioned tuning circuit may be covered, and is outputted from those coils.

[Claim 7] The direction discernment means of the above 1st is a digitizer according to claim 4 characterized by consisting of a field attenuating means which weakens the output level of the electric wave which is attached in the front face of the above-mentioned sensor, and one [ at least ] field of the above-mentioned indicator so that some of above-mentioned loop-formation coils and coils of the above-mentioned tuning circuit may be covered, and is outputted from those coils.

[Claim 8] At least two coils with which the magnitude by which the direction discernment means of the above 1st has been arranged asymmetrically [ it is wound independently and ] in the above-mentioned tuning circuit differs, It has two loop-formation coils arranged in the isomorphism used as each loop-formation coil of the above-mentioned sensor, and a location which is different in Doshisha University. The digitizer according to claim 4 characterized by performing direction distinction of the above-mentioned indicator by comparing the voltage level of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from two coils of the above-mentioned tuning circuit.

[Claim 9] The coil with which the direction discernment means of the above 1st was formed in the shape of a triangle in the above-mentioned tuning circuit, It has two loop-formation coils arranged in the isomorphism used as each loop-formation coil of the above-mentioned sensor, and a location which is different in Doshisha University. The digitizer according to claim 4 characterized by performing direction distinction of the above-mentioned indicator by comparing the voltage level of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from the coil of the shape of a triangle of the above-mentioned tuning circuit.

[Claim 10] The location detecting element to which it has the sensor and indicator which transmit and receive an electromagnetic signal mutually, and the above-mentioned sensor comes to arrange two or more loop-formation coils to a predetermined plane, The selection circuitry which makes sequential selection of the one loop-formation coil from two or more above-mentioned loop-formation coils, The receiving circuit which detects the induced voltage generated in the sending circuit and this loop-formation coil which supply the AC signal of predetermined frequency to the above-mentioned loop-formation coil, It has the electronic switch which connects to the above-mentioned sending circuit and the above-mentioned receiving circuit by turns one loop-formation coil chosen in the above-mentioned selection circuitry. The tuning circuit which sides with the electric wave generated from the loop-formation coil with which the above-mentioned AC signal was supplied including a coil and a capacitor in the above-mentioned indicator is prepared. In the digitizer which detects the location of the above-mentioned indicator with the induced voltage by which induction is carried out to the above-mentioned loop-formation coil by the electric wave generated from the coil of the above-mentioned tuning circuit The digitizer characterized by establishing the 2nd direction discernment means which the phase of the electromagnetic signal transmitted and received between the coil of the above-mentioned tuning circuit and each loop-formation coil of the above-mentioned sensor is changed with the sense of the above-mentioned indicator, and identifies the direction of this indicator.

[Claim 11] Two coils around which the direction discernment means of the above 2nd differed in the attaching position and the output level of an electric wave in the above-mentioned tuning circuit, and transmission and reception of a signal were wound so that it might become opposition, It has two loop-formation coils arranged in a different location used as each loop-formation coil of the above-mentioned sensor. The digitizer according to claim 10 characterized by performing direction distinction of the above-mentioned indicator by comparing the phase of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from two coils of the above-mentioned tuning circuit.

[Claim 12] Two loop-formation coils arranged in a different location used as each loop-formation coil of the above-mentioned sensor It consists of a large coil which wraps two coils of the above-mentioned tuning circuit, and a small coil smaller than it which has been arranged in the Doshisha University coil. It is the digitizer according to claim 11 which transmits towards the above-mentioned tuning circuit from the above-mentioned large coil, and is characterized by receiving the electric wave from this tuning circuit with the above-mentioned size and the coil of two smallness.

[Claim 13] Two coils of the above-mentioned tuning circuit are digitizers according to claim 11 characterized by consisting of what developed one coil winding object in the shape of [ of 8 ] a character.

[Claim 14] The location detecting element to which it has the sensor and indicator which transmit and receive an electromagnetic signal mutually, and the above-mentioned sensor comes to arrange two or more loop-formation coils to a predetermined plane, The selection circuitry which makes sequential selection of the one loop-formation coil from two or more above-mentioned loop-formation coils, The receiving circuit which detects the induced voltage generated in the sending circuit and this loop-formation coil which supply the AC signal of predetermined frequency to the above-mentioned loop-formation coil, It has the electronic switch which connects to the above-mentioned sending circuit and the above-mentioned receiving circuit by turns one loop-formation coil chosen in the above-mentioned selection circuitry. The tuning circuit which sides with the electric wave generated from the loop-formation coil with which the above-mentioned AC signal was supplied including a coil and a capacitor in the above-mentioned indicator is prepared. In the digitizer which detects the location of the above-mentioned indicator with the induced voltage by which induction is carried out to the above-mentioned loop-formation coil by the electric wave generated from the coil of the above-mentioned tuning circuit While being constituted so that the output levels of the electric wave outputted from the coil of the above-mentioned tuning circuit may differ by the front-face [ of the above-mentioned indicator ], and rear-face side The digitizer characterized by establishing a direction discernment means to change the level of the electromagnetic signal transmitted and received in between [ these ], and its phase with the sense of the above-mentioned indicator, and to identify the direction of this indicator, between the coil of the above-mentioned tuning circuit, and each loop-formation coil of the above-mentioned sensor.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** This invention relates to the suitable digitizer for game machines, such as shogi, the game of go, othello (Sergo's, Inc. trademark), or chess, if it says in more detail about the digitizer which detects the location of various kinds of coordinate indicators.

**[0002]**

**[Description of the Prior Art]** When applying a digitizer to a game machine, it is necessary to enable it to identify not only the location of a chip but a front flesh side in othello. Moreover, in the case of shogi, in addition to it, the sense of a piece must also be identified.

**[0003]** An indicator must be made cordless as a former problem from it. For this reason, these people proposed cordless type location detection equipment (digitizer) as Japanese Patent Application No. No. 213970 [ 61 to ] previously.

**[0004]** If the principle of this location detection equipment is explained shortly, while arranging two or more loop-formation coils to the location detecting element as a sensor and making sequential selection of one of the loop-formation coils in a selection circuitry, that loop-formation coil is connected to a sending circuit and a receiving circuit by turns through an electronic switch. On the other hand, the tuning circuit which sides with an electric wave from a loop-formation coil is established in a position indicator side including a capacitor and a coil.

**[0005]** An electric wave is sent out from the coil of a position indicator by alignment of this tuning circuit. It is distinguished by induction of the electrical potential difference being carried out by this electric wave, and detecting this by it in a receiving circuit, when a receiving circuit changes from a sending circuit to a loop-formation coil on which loop-formation coil the indicator is placed.

**[0006]**

**[Problem(s) to be Solved by the Invention]** According to the above-mentioned equipment, it is possible to detect the location correctly as cordless in an indicator, but the front flesh side and sense of an indicator are undetectable, therefore if it remains as it is, they are inapplicable to the above game machines.

**[0007]** This invention was made in view of such a situation, and the 1st purpose is in offering the digitizer which enabled it to distinguish the front flesh side of an indicator with an easy configuration.

**[0008]** Moreover, the 2nd purpose of this invention is to offer the digitizer which enabled it to distinguish the sense of an indicator with an easy configuration.

**[0009]** Furthermore, the 3rd purpose of this invention is to offer the digitizer which enabled it to distinguish the front flesh side and sense of an indicator with an easy configuration.

**[0010]**

**[Means for Solving the Problem]** The location detecting element to which this invention has the sensor and indicator which transmit and receive an electromagnetic signal mutually, and the above-mentioned sensor comes to arrange two or more loop-formation coils to a predetermined plane in order to attain the 1st purpose of the above, The selection circuitry which makes sequential selection of the one loop-formation coil from two or more above-mentioned loop-formation coils, The receiving circuit which detects the induced voltage generated in the sending circuit and this loop-formation coil which supply the AC signal of predetermined frequency to the above-mentioned loop-formation coil, It has the electronic switch which connects to the above-mentioned sending circuit and the above-mentioned receiving circuit by turns one loop-formation coil chosen in the above-

mentioned selection circuitry. The tuning circuit which sides with the electric wave generated from the loop-formation coil with which the above-mentioned AC signal was supplied including a coil and a capacitor in the above-mentioned indicator is prepared. In the digitizer which detects the location of the above-mentioned indicator with the induced voltage by which induction is carried out to the above-mentioned loop-formation coil by the electric wave generated from the coil of the above-mentioned tuning circuit It is characterized by being constituted so that the output levels of the electric wave outputted from the coil of the above-mentioned tuning circuit may differ by the front-face [ of the above-mentioned indicator ], and rear-face side.

[0011] In this case, which means of whether to establish the field attenuating means which weakens the output level of the electric wave outputted from the coil of the above-mentioned tuning circuit to either the front-face side of the above-mentioned indicator or a rear-face side contrary to whether the ferromagnetic which strengthens the output level of the electric wave outputted from the coil of the above-mentioned tuning circuit to either the front-face side of the above-mentioned indicator or a rear-face side is prepared, and this may be provided. As this field attenuating means, the metal which has conductivity with non-magnetic material, for example, the mesh (mesh) object which consists of copper or aluminum, a plating coating, etc. are mentioned.

[0012] Moreover, in order that this invention may attain the 2nd purpose of the above, in the above-mentioned digitizer, it is characterized by establishing the 1st direction discernment means which the level of the electromagnetic signal transmitted and received in between [ these ] is changed with the sense of the above-mentioned indicator, and identifies the direction of this indicator between the coil of the above-mentioned tuning circuit, and each loop-formation coil of the above-mentioned sensor.

[0013] Although the direction discernment means of the above 1st is formed preferably [ both ] by making each of the loop-formation coil of the above-mentioned sensor, and the coil of the above-mentioned tuning circuit into the unsymmetrical configuration of isomorphism, it may make cover it with the ferromagnetic which strengthens more simply the output level of the electric wave outputted from those coils in some of above-mentioned loop-formation coils and coils of the above-mentioned tuning circuit in the front face of the above-mentioned sensor, and one [ at least ] field of the above-mentioned indicator. You may make it cover in the field attenuating means which similarly weakens the output level of the electric wave outputted from those coils in some of above-mentioned loop-formation coils and coils of the above-mentioned tuning circuit in the front face of the above-mentioned sensor, and one [ at least ] field of the above-mentioned indicator.

[0014] On the other hand, at least two coils with which the magnitude arranged asymmetrically [ it is wound independently and ] in the above-mentioned tuning circuit in the direction discernment means of the above 1st differs, It constitutes from two loop-formation coils arranged in the isomorphism used as each loop-formation coil of the above-mentioned sensor, and a location which is different in Doshisha University. It may be made to perform direction distinction of the above-mentioned indicator by comparing the voltage level of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from two coils of the above-mentioned tuning circuit.

[0015] Furthermore, the coil formed in the shape of a triangle in the above-mentioned tuning circuit in the direction discernment means of the above 1st, It constitutes from two loop-formation coils arranged in the isomorphism used as each loop-formation coil of the above-mentioned sensor, and a location which is different in Doshisha University. It may be made to perform direction distinction of the above-mentioned indicator by comparing the voltage level of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from the coil of the shape of a triangle of the above-mentioned tuning circuit.

[0016] Moreover, in the above-mentioned digitizer, the 2nd purpose of the above changes the phase of the electromagnetic signal transmitted and received between the coil of the above-mentioned tuning circuit, and each loop-formation coil of the above-mentioned sensor with the sense of the above-mentioned indicator, and is attained also by having the 2nd direction discernment means which identifies the direction of this indicator.

[0017] Two coils around which the direction discernment means of the above 2nd differed in the attaching position and the output level of an electric wave in the above-mentioned tuning circuit, and transmission and reception of a signal were wound so that it might become opposition, It has two loop-formation coils arranged in a different location used as each loop-formation coil of the above-mentioned sensor. By comparing the phase of the induced voltage in which induction is carried out to the two above-mentioned loop-formation coils by the electric wave from two coils of the above-mentioned tuning circuit, it is desirable that it is made to perform

direction distinction of the above-mentioned indicator.

[0018] In this case, two loop-formation coils arranged in a different location used as each loop-formation coil of the above-mentioned sensor consist of large coils which wrap two coils of the above-mentioned tuning circuit, and small coils smaller than it which has been arranged in the Doshisha University coil, it transmits towards the above-mentioned tuning circuit from the above-mentioned large coil, and it may make the above-mentioned size and the coil of two smallness receive the electric wave from this tuning circuit. In addition, it becomes easy by developing one coil winding object in the shape of [ of 8 ] a character the to manufacture two coils of the above-mentioned tuning circuit.

[0019] While this invention is constituted so that the output levels of the electric wave outputted from the coil of the above-mentioned tuning circuit may differ by the front-face [ of the above-mentioned indicator ], and rear-face side in the above-mentioned digitizer in order to attain the 3rd purpose of the above It is characterized by establishing a direction discernment means to change the level of the electromagnetic signal transmitted and received in between [ these ], and its phase with the sense of the above-mentioned indicator, and to identify the direction of this indicator, between the coil of the above-mentioned tuning circuit, and each loop-formation coil of the above-mentioned sensor.

[0020]

[Function] According to the above-mentioned configuration, with the front face and rear face of an indicator, since the strength of the electric wave sent out from the coil of a tuning circuit differs, the front flesh side of an indicator can be distinguished by detecting the level of the induced voltage of the loop-formation coil in which induction is carried out by the electric wave by the sensor side.

[0021] Moreover, according to the 1st direction discernment means, it becomes possible to distinguish the sense (direction) of an indicator like the above-mentioned front flesh-side distinction with the sense of the indicator to a loop-formation coil, since the level of the electromagnetic signal transmitted and received between the coil of a tuning circuit and each loop-formation coil of a sensor differs. In addition, with the 2nd direction discernment means, by detecting the phase of the induced voltage by which induction is carried out to a loop-formation coil, an indicator is suitable like the 1st direction discernment means, and \*\* is distinguished.

[0022] By forming an above-mentioned front flesh-side discernment means and an above-mentioned direction discernment means in one indicator, that indicator can be applied to the piece of shogi and distinction of the class of indicator as a piece is attained by changing a frequency and a phase for every indicator in this case. Moreover, according to this digitizer, it becomes possible to make memory etc. memorize all those aspects of affairs, for example, to make it reappear on a display.

[0023]

[Example] Hereafter, the example of this invention is explained, referring to a drawing. First, the fundamental configuration of this digitizer is explained based on drawing 1 .

[0024] According to this, this digitizer is equipped with the sensor 10 as a location detecting element. This example is a thing at the time of applying to a shogi board, therefore the loop-formation coils 101,102-1081 are arranged in this sensor 10 at the same flat-surface top, respectively in a total of 81 grids of the length of nine lines, and width 9 train.

[0025] Each loop-formation coils 101-1081 are connected to the selection circuitry 20. This selection circuitry 20 makes sequential selection of that one loop-formation coil 10n in predetermined sequence from each loop-formation coils 101-1081, the end of each loop-formation coils 101-1081 is connected to one terminal block 21, and the other end is connected to the terminal block 22 of another side. Terminal blocks 21 and 22 are changed by every one selection contacts 23 and 24 which each of those contacts are interlocked with. In addition, this selection circuitry 20 may be a well-known multiplexer, and that actuation is controlled by CPU (central-process unit)60.

[0026] One loop-formation coil 10n chosen by the selection circuitry 20, it connects with a sending circuit 40 and a receiving circuit 50 by turns through an electronic switch 30. That is, the above-mentioned selection contacts 23 and 24 are connected to the transfer contacts 31 and 32 of this electronic switch 30, respectively, and a transfer contact 31 is changed to one output terminal 33 of a sending circuit 40, and one input terminal 34 of a receiving circuit 50, and a transfer contact 32 is changed to the output terminal 35 of another side of a sending circuit 40, and the input terminal 36 of another side of a receiving circuit 50.

[0027] In this case, transfer contacts 31 and 32 interlock mutually and change by turns one loop-formation coil

10n chosen by the selection circuitry 20 to a transmitting side and a receiving side based on the transmission-and-reception change signal from a sending circuit 40. This electronic switch 30 is also constituted by the well-known multiplexer.

[0028] The indicator 70 is shown in drawing 2. In this example, this indicator 70 is formed in the configuration of the piece of shogi, and the tuning circuit 71 is established in that interior. In this example, this tuning circuit 71 consists of a series resonant circuit of coil 71a and capacitor 71b, and that numeric value is chosen as the value which resonates in the frequency of the electric wave sent out from each loop-formation coil 10n of a sensor 10 (alignment).

[0029] If actuation is explained, first, the transfer contacts 31 and 32 of an electronic switch 30 will be changed to output terminal [ of a sending circuit 40 ] 33, and 35 side, the AC signal of predetermined frequency will be supplied from a sending circuit 40 to one loop-formation coil 10n chosen by the selection circuitry 20 by this, and the electric wave according to the frequency will be sent out from this loop-formation coil 10n.

[0030] If the indicator 70 is placed on the loop-formation coil 10n, coil 71a of a tuning circuit 71 will be excited by the electric wave, and the induced voltage which synchronized with the tuning circuit 71 at it will occur.

[0031] The transfer contacts 31 and 32 of an electronic switch 30 are changed to input terminal [ of a receiving circuit 50 ] 34, and 36 side after predetermined time progress. By this, although a loop-formation coil 10n electric wave is extinguished immediately, in the tuning circuit 71 of an indicator 70, the above-mentioned induced voltage will decline gradually, and an electric wave will occur from coil 71a according to the current which flows to a tuning circuit 71 based on the induced voltage.

[0032] In this loop-formation coil 10n, induced voltage generates this electric wave in order to excite loop-formation coil 10n by the side of a sensor 10 conversely. By detecting this induced voltage in a receiving circuit 50, it is distinguished on which loop-formation coil 10n the indicator 70 has set.

[0033] The example which makes the front flesh side of an indicator 70 identifiable is shown in drawing 3. The front flesh side of an indicator 70 is identified by making theoretically the strength of the electric wave sent out from coil 71a of a tuning circuit 71 into level which is different by the front-face [ of an indicator 70 ], and rear-face side, and detecting the level of the induced voltage which appears in the loop-formation coil 10n side in proportion to this in a receiving circuit 50, for example, comparing by CPU60.

[0034] But simply, as shown in this drawing (a), it inclines toward either the front-face side of an indicator 70, or a rear-face side, and coil 71a is arranged. The ferromagnetics 72, such as a ferrite which strengthens the output level of the electric wave sent out from coil 71a to either the front-face side of an indicator 70 or a rear-face side as shown in this drawing (b), are attached. In this case, as for a ferromagnetic 72, it is desirable to be attached so that what has predetermined thickness and was small formed compared with coil 71a may be located in the core of this coil 71a.

[0035] With this, on the contrary, as shown in this drawing (c), the electric-field attenuating means 73 which weakens the output level of the electric wave sent out from coil 71a to either the front-face side of an indicator 70 or a rear-face side is established. The metal which is non-magnetic material and has conductivity as this electric-field attenuating means 73, for example, the mesh object which consists of copper or aluminum, a plating coating, etc. are used, and it is attached so that the rf radiation side of coil 71a may be covered preferably.

[0036] In addition, what is necessary is to attach a ferromagnetic 72 for example, in the front-face side of an indicator 70, and just to form the electric-field attenuating means 73 in a rear-face side, as shown in this drawing (d) in order to enlarge a disregard level difference more and to raise discernment precision.

[0037] Next, the configuration for making the sense (direction) of an indicator 70 identifiable is explained. The example which identifies the sense of an indicator 70 with the level of the induced voltage which appears in the loop-formation coil 10n side is shown in drawing 4 thru/or drawing 8.

[0038] Among these, in the example of drawing 6, it is formed in isomorphism (ellipse in this case), and Doshisha University from drawing 4 both loop-formation coil 10n by the side of coil 71a of a tuning circuit 71, and a sensor 10. Moreover, in these drawings, the (a) side is an indicator 70, and the (b) side is a sensor 10 side.

[0039] the example of drawing 4 -- loop-formation coil 10n of coil 71a of an indicator 70, and a sensor 10 -- he is trying to attach a ferromagnetic 72 in both lower half sides Here, it is based on the vertical direction of a drawing in a top and the bottom. According to this, rather than the case where it carries out to oppose ferromagnetic 72 comrades, electromagnetic association becomes [ the direction at the time of making an



indicator 70 upside-down and making it a ferromagnetic 72 not lap ] weak, and induced voltage appears low in the part loop-formation coil 10n. Direction distinction is performed by difference of this voltage level. In addition, a ferromagnetic is attached in the upper half side of one coil, and you may make it attach a ferromagnetic in the lower half side of the coil of another side unlike this example.

[0040] on the other hand -- the example of drawing 5 -- loop-formation coil 10n of coil 71a of an indicator 70, and a sensor 10 -- both -- a lower half -- the field attenuating means 73 -- a wrap -- it is made like. According to this, rather than the case where it carries out to oppose field attenuating means 73 comrades, electromagnetic association becomes [ the direction in case an indicator 70 is made upside-down, and the \*\*\*\*\* attenuating means 73 does not lap, therefore the field attenuating means 73 intervenes over coil 71a, loop-formation coil 10n, and the whole surface of a between ] weak, and induced voltage becomes low at the part loop-formation coil 10n. In addition, the upper half of one coil is covered by the field attenuating means, and you may make it cover the lower half of the coil of another side by the field attenuating means also in this example.

[0041] in order to enlarge more the difference of the induced voltage which appears in loop-formation coil 10n, it is shown in drawing 6 -- as -- loop-formation coil 10n of coil 71a of an indicator 70, and a sensor 10 -- while attaching a ferromagnetic 72 in both upper half sides -- those lower half side -- the field attenuating means 73 -- a wrap -- what is necessary is just to make it like

[0042] The example from which it was made for a disregard level to differ with the sense of an indicator 70 is shown without being based on an above-mentioned ferromagnetic 72 and the above-mentioned field attenuating means 73 at drawing 7 and drawing 8. In the example of drawing 7, both coil 71a of an indicator 70 and loop-formation coil 10n of a sensor 10 are made into isomorphism and the unsymmetrical configuration of Doshisha University, for example, an isosceles triangle, as shown in this drawing (a) and (b). When according to this it piles up so that 10n may become congruent with both coil 71a, electromagnetic association between both coil 71a becomes strong, therefore bigger induced voltage appears in loop-formation coil 10n rather than the case where make an indicator 70 upside-down and it is piled up.

[0043] In addition, the loop-formation coil by the side of a sensor 10 may be set to isomorphism, two loop-formation coil 10n1 of Doshisha University, and 10n2, and this and coil 71a of this drawing (a) may be combined as shown in this drawing (c). According to this, since an electric wave is strongly sent out for the direction near the top-most vertices of coil 71a, induction of the 10n of the induced voltage of loop-formation coil 10n1 and level which is different in 2 will be carried out. In addition, let 10n be two loop-formation coil 10n1 and the thing which transmits to coincidence from 2 and also performs reception to coincidence.

[0044] Moreover, he is trying to prepare isomorphism, two loop-formation coil 10n1 of Doshisha University, and the coil 71a1 of two size from which a path differs although it is in phase and 71a2 in a tuning circuit 71 by preparing 2 [ 10n ] as well as drawing 7 R> 7 (c) in the example of drawing 8 at a sensor 10 side at an indicator 70 side. According to this, when the number of turns of a coil is made the same, since an electric wave stronger than the minor diameter coil 71a2 is sent out, from the coil 71a1 of a major diameter, induction of the 10n of the induced voltage of loop-formation coil 10n1 and level which is different in 2 will be carried out like the example of drawing 7. Also in this case, let 10n be two loop-formation coil 10n1 and the thing which transmits to coincidence from 2 and also performs reception to coincidence.

[0045] The example which enabled it to identify the sense of an indicator 70 not with a voltage level but with a phase (are they an inphase or opposition in this case?) is shown in drawing 9 and drawing 10. Although two coils used as opposition are theoretically prepared in an indicator 70 side, the example is shown in drawing 9.

[0046] That is, the coil C turned several predetermined turns as shown in this drawing (a) is prepared, and the part is developed in the shape of [ of 8 ] a character, as shown in this drawing (b). although two coils 71a3 and 71a4 are obtained by this -- a coil 71a3 and 71a4 -- opposition -- it is -- and magnitude or number of turns -- things -- it is made like. What is necessary is just to change the magnitude and number of turns both, in order to enlarge these level differences more. And these two coils 71a3 and 71a4 are used as a coil in the tuning circuit 71 of an indicator 70. (Refer to drawing 10 (a)).

[0047] On the other hand, two loop-formation coil 10n1 of isomorphism, Doshisha University, and these number of turns and 10n2 are prepared in a sensor 10 side as shown for example, in this drawing (b). In this case, the electric wave of an inphase is sent out to coincidence from two loop-formation coil 10n1 and 10n2. Although it is excited by hard flow, respectively when this electric wave is received by two coils 71a3 of an indicator 70, and 71a4, the larger one or the direction with many number of turns will overcome. For this

reason, another coil becomes opposition although the larger one or the direction with many number of turns becomes an inphase to a sending signal.

[0048] Next, although 10n receives by either of 2 with loop-formation coil 10n1 of a sensor 10, the posture of an indicator 70 will receive the signal sent out from one of a coil 71a3 and 71a4 in this case. The coil of the loop-formation coil 10n1 or the indicator 70 which has 10n on 2 of the sensor 10 which will have been received if the input signal is in phase to a sending signal becomes the larger one or the direction with many number of turns. On the other hand, if it is opposition, the coil of an indicator 70 will become the smaller one or the direction with few number of turns.

[0049] Thus, the direction of an indicator 70 is identified because two loop-formation coil 10n1 and the signals received by either among 2 10n of a sensor 10 judge an inphase or opposition to a sending signal.

[0050] Another example of the loop-formation coil by the side of the sensor 10 used combining the indicator 70 of this drawing (a) is shown in drawing 10 (c). the magnitude which can surround two coils 71a3 of an indicator 70, and the both sides of 71a4 to a sensor 10 side according to this -- a large -- coil 10n3 -- this -- a large -- coil 10n3 are arranged in the location of non-\*\*\*\* -- having -- large coil 10n -- it corresponds in three at the above-mentioned coil 71a3 and one side of 71a4 -- small -- coil 10n4 are prepared.

[0051] in this case -- a large -- from coil 10n3 -- transmitting -- the above-mentioned coil 71a3 and the electric wave from 71a4 -- a large -- coil 10n3 -- small -- or it receives to coincidence by coil 10n4 -- or one of the above-mentioned coil 71a3 and 71a4 -- small -- it receives by coil 10n4.

[0052] When receiving to coincidence by the large coil 10n3 and smallness coil 10n4 The phase of those input signals is compared. When a phase is reverse A coil with many [ an indicator 70 ] the small coil 71a4 or the coil of the direction with few number of turns same with the sense of drawing 10 (a) to the large coil 71a3 with an indicator 70 become facing up and opposite to the sense of drawing 1010 (a) in the case of an inphase or number of turns serves as facing up.

[0053] On the other hand, to a sending signal, when receiving one of the above-mentioned coil 71a3 and 71a4 by smallness coil 10n4, if an input signal is opposition If the small coil 71a4 or the coil of the direction with few number of turns same with the sense of drawing 10 (a) serves as facing up and an indicator 70 has the input signal in phase to a sending signal, the large coil 71a3 with an indicator 70 opposite to the sense of drawing 10 R> 0 (a) or a coil with many number of turns will serve as facing up.

[0054] Thus, although the front flesh side and sense of an indicator 70 are discriminable, when it is going to identify both a front flesh side and the sense on the level of the induced voltage which appears in loop-formation coil 10n, it is necessary to set up the threshold of four kinds of level.

[0055] Moreover, in the case of the piece of shogi etc., the class can also be distinguished by changing the tuning frequency or the phase of a tuning circuit 71 of an indicator 70 for every indicator.

[0056] Here, the case where shogi is concretely carried out using the digitizer of this invention is explained. First, it recognizes including a self-army, enemy troops, etc. with the class and sense of all pieces (indicator 70) on the face of a board (sensor 10), and RAM (random access memory)61 as a storage means is made to memorize through CPU60.

[0057] The side to which the piece moved previously is made into a smith helper, and a program is henceforth set up as that to which a piece moves by turns. Decision of one aspect of affairs determines the condition in front of a way as one aspect of affairs, and RAM61 is made to memorize it one by one. As an example, when eye two hands moves, the aspect of affairs of a way eye is decided. The difference in the motion by the class of piece etc. is controlled by the program according to the regulation of shogi, and sets up a malfunction prohibition function.

[0058] When its piece moves on the piece of the other party and a partner's piece is lost, it is made to judge that he had the partner's piece and it turned into a piece. case it is reverse -- the same . When the piece on the face of a board does not move but one piece increases on the face of a board, it has and it is made to judge that the piece was struck. When a user pushes \*\*\*\*\* etc. in termination, while the last aspect of affairs is decided, it is written in RAM61.

[0059] According to this, it is also possible to read and carry out Replay of the required aspect of affairs to arbitration later. Moreover, it is possible to make shogi, the game of go, etc. a remote place but without moving from its seat using means of communications, and record of a record of the moves and plays of a game of Go also becomes unnecessary by making memory memorize.

[0060] In addition, although application to a game machine was explained chiefly, as for this invention, it is needless to say for it to be able to apply to various kinds of devices which are not limited to this and need discernment of the front flesh side of an indicator or the sense.

[0061]

[Effect of the Invention] As explained above, according to this invention, in the digitizer which prepared and made the tuning circuit cordless to the indicator, the front flesh-side distinction can be performed simply and with high precision by changing the electric wave sent out from the tuning circuit with the front face and rear face of an indicator.

[0062] Moreover, according to the 1st direction discernment means, though it is an easy configuration like the above-mentioned front flesh-side distinction by having made it change the level of the electromagnetic signal transmitted and received between the coil of a tuning circuit, and each loop-formation coil of a sensor with the sense of the indicator to the loop-formation coil by the side of a sensor, the sense (direction) of an indicator can be distinguished with a sufficient precision. In addition, according to the 2nd direction discernment means, though it is an easy configuration like the 1st direction discernment means by preparing two coils used as opposition in the tuning circuit by the side of an indicator, and detecting the phase of the induced voltage by which induction is carried out to the loop-formation coil by the side of a sensor, the sense of an indicator can be distinguished with a sufficient precision.

[0063] Furthermore, by forming an above-mentioned front flesh-side discernment means and an above-mentioned direction discernment means in one indicator, that indicator can be applied to the piece of shogi and distinction of the class of indicator as a piece is attained by changing a frequency and a phase for every indicator in this case. Moreover, according to this digitizer, it becomes possible to make memory etc. memorize all those aspects of affairs, for example, to make it reappear on a display.

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[Translation done.]

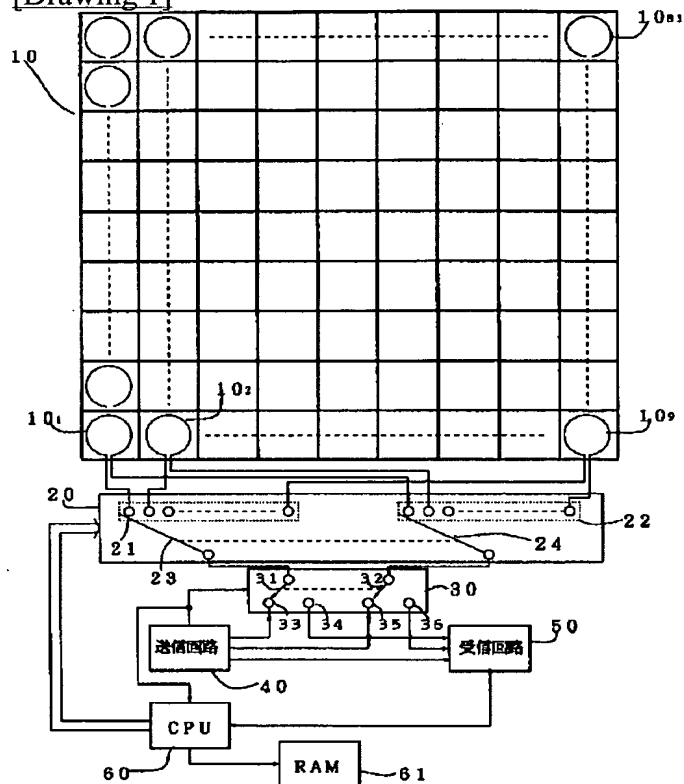
## \* NOTICES \*

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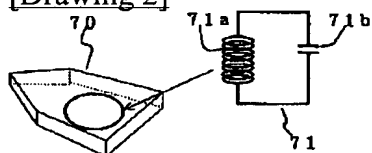
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

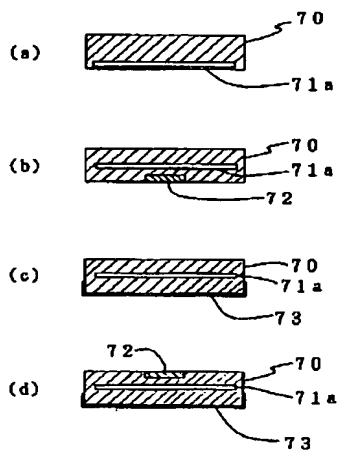
[Drawing 1]



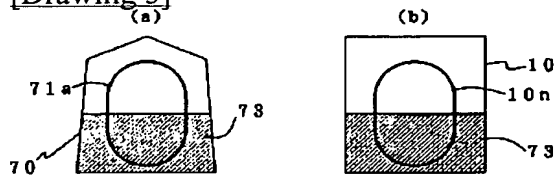
[Drawing 2]



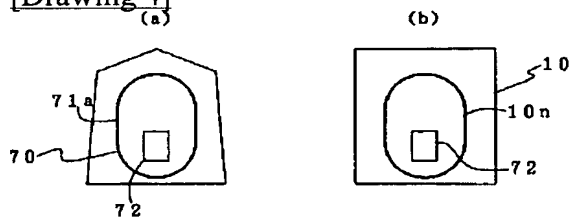
[Drawing 3]



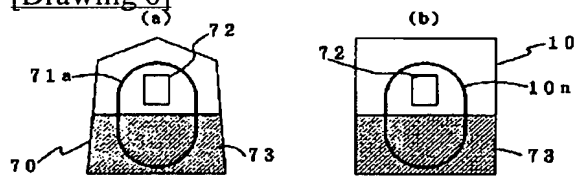
[Drawing 5]



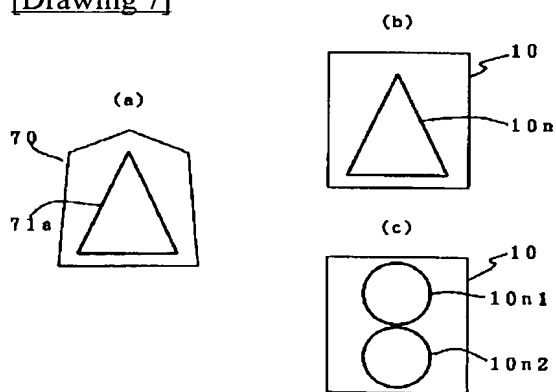
[Drawing 4]



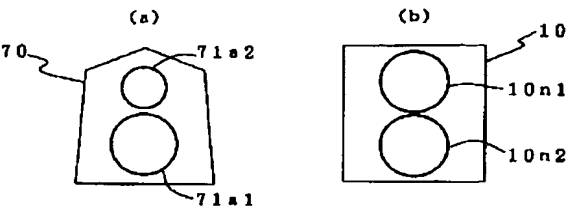
[Drawing 6]



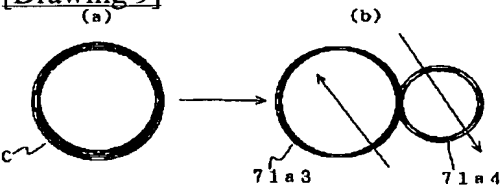
[Drawing 7]



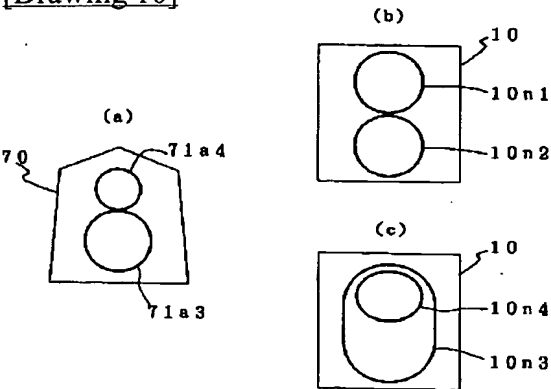
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]